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(54) **System for facilitating editing of audiovisual data**

(57) A system for facilitating development of information material comprises a material generation apparatus operable to generate information material and metadata describing the content of the information material and to store the information material on a data carrier and to store the metadata separately in a data store. The system includes at least one metadata node operable to process the metadata, and a data communications network for providing a facility for communicating the metadata to and from the metadata node. The data communications network and the material generation apparatus each include a wireless data communicator

for providing a wireless data communications link with the material generation apparatus and the network. The wireless data communications link provides a facility for communicating the metadata to the metadata node via the network, when the generation apparatus is within range for data communications via the wireless link. Accordingly, a facility for producing information material such as a/v material is provided with an improved work flow, because metadata generated with the a/v material can be communicated systematically to an ingestion processor or the like separately via the wireless link when in range. Navigation and editing of the material is thereby facilitated.

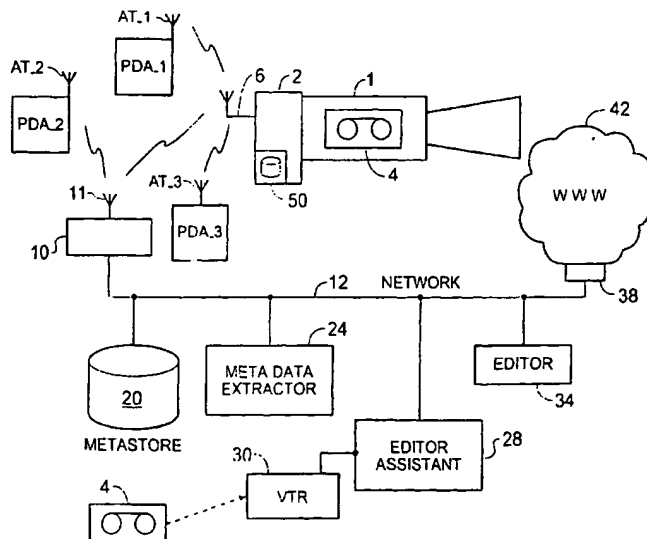


Fig. 1

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**Description****Field of the Invention**

5 [0001] The present invention relates to systems for facilitating development of information material and methods of facilitating development of information material.

[0002] In some embodiments the information material may include audio and/or video material or data material.

**Background of the Invention**

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[0003] Co-pending UK patent applications 0008431.9, 0008393.1 and 0008427.7 disclose a system for generating audio and/or video (a/v) productions comprising a camera with a camera adapter box and a personal digital assistant (PDA). The camera adapter box and the digital assistant are provided with a wireless communications link. The camera is arranged in use to generate a/v material by capturing images and sounds which are recorded on a recording medium such as a cassette tape. The adapter box generates metadata describing the content of the a/v material and/or other attributes of the a/v material such as camera parameter settings used to generate the a/v material. The metadata may be communicated via the wireless communications link to the PDA and stored separately from the a/v material. Accordingly, pre-planned shots or excerpts of an a/v production may be associated with metadata items for the a/v material generated by the camera for a particular pre-planned shot or excerpt.

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20 [0004] Although this system provides a facility for generating a/v material in combination with metadata, there is a need to make further improvements to work flow for generating an a/v production or indeed other types of information material using metadata.

**Summary of Invention**

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[0005] According to the present invention there is provided a processing system for facilitating production of information material. The system comprises an information material generation apparatus operable to generate information material and metadata describing the content or attributes of the information material and to store the information material on a data carrier and to store the metadata typically but not always separately from the information material in a data store. The system also comprises at least one metadata node operable to process the metadata, and a data communications network for providing a facility for communicating the metadata to and from the metadata node. A metadata node may be any data processor, storage device or metadata generation apparatus for generating, processing or storing metadata. The data communications network and the material generation apparatus each include a wireless data communicator for providing a wireless data communications link with the material generation apparatus and the network. The wireless data communications link provides a facility for communicating the metadata to the metadata node via the network.

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[0006] Embodiments of the present invention provide an improved facility for generating information material such as a/v material by making metadata describing the content or attributes associated with the a/v material more readily accessible to devices (metadata nodes) which use the metadata. The metadata may be used, for example, by a processing device to navigate through the stored a/v material or to edit the material. In one embodiment the material generation apparatus may be a camera having a camera adapter box for generating the metadata and/or communicating the metadata via the wireless communication link.

40

[0007] The wireless data communications link provides a facility for communicating the metadata to the metadata node via the network, when the generation apparatus is within range for data communications via the wireless link. Accordingly, the work flow for producing information material, such as a/v material, is improved because metadata generated with the a/v material can be communicated systematically via the wireless link, as soon as the metadata generation apparatus is within wireless communications range of the network.

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[0008] The metadata transfer to other metadata nodes can be effected automatically via application programmer's interface operating on the metadata nodes including the metadata generation apparatus.

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[0009] The data communications network may operate in one embodiment in accordance with an Ethernet protocol, and the wireless communications link may operate in accordance with a wireless Ethernet protocol. Various further aspects and features of the present invention are defined in the appended claims.

**Brief Description of Drawings**

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[0010] Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings, where like parts are provided with corresponding reference numerals, and in which:

Figure 1 is a schematic block diagram of a system for generating an a/v production according to an example embodiment of the invention;

Figure 2 is a schematic block diagram of a camera with a camera adapter box and personal digital assistants shown in figure 1 operating remotely;

Figure 3 is a representation of software processors operating on devices forming metadata nodes connected to the network shown in Figure 1;

Figure 4 is a schematic representation illustrating the operation of the software processors shown in Figure 3, including an application programmer's interface according to an embodiment of the present invention;

Figure 5 is a schematic block diagram illustrating a sequence of operations which are performed by the camera adapter box and a meta store appearing in Figure 1, by the applications programmer's interfaces which appear in Figures 3 and 4; and

Figure 6A and 6B is an illustration of a metadata string in the form of an extended mark-up language, which are communicated by the system shown in Figure 1 as illustrated in Figure 5.

## **Description of Preferred Embodiments**

### **System Overview**

[0011] Figure 1 provides an example configuration illustrating embodiments of the present invention. Embodiments of the present invention provide a facility for generating material in an efficient and cost-effective manner. Advantages of the embodiments will become apparent from the following explanation. However, generally, the workflow in generating material is improved, with an enhanced arrangement for compatibly and consistently communicating metadata.

[0012] Figure 1 provides an example illustration of a system and apparatus embodying the present invention, in which an audio/video (a/v) production is made. Thus, in the following description, the material generated is a/v material. However, it will be appreciated that a/v material is just one example of information material which can be generated. Other examples include financial data, inventory data or indeed any other kind of information, particularly, but not exclusively, where the amount of information generated makes it difficult for users to navigate through this material.

[0013] In Figure 1, a camera 1 includes a camera adapter box 2. The camera 1 is an example of a material generation apparatus. The camera 1 in operation captures images and sounds and represents these images and sounds as a/v material which is recorded on a cassette tape 4. The cassette tape 4 provides a linear storage medium but is one example of a data carrier on which the audio/video material may be stored. Another example of a data carrier could be a non-linear storage medium such as a hard disk. However it will be appreciated that the data carrier could be any medium or signal for representing data.

[0014] According to the example embodiment, the camera adapter box 2 is a mountable unit, which can be removed from the camera 1. However, it will be appreciated that the camera adapter box is just one example of a utility unit, which, in alternative embodiments may be integrated within the camera 1. In a general sense the camera adapter box 2 is a utility device, the function of which is explained in the following paragraphs.

[0015] The camera adapter box 2 attached to the camera 1 provides a facility for generating metadata. The metadata may comprise different metadata types, some of which may describe the content of the a/v material and others may describe the attributes of the camera which were used when the a/v material was generated. The camera adapter box 2 also includes an antenna 6, which is coupled to a radio communications transmitter/receiver within the camera adapter box 2. The radio communications transmitter/receiver (not shown in Figure 1) provides a facility for radio communications with a wireless ethernet communicator 10 via an antenna 11 through which ethernet communication is provided with devices connected to a network 12.

[0016] As shown in Figure 1, devices are connected to the network 12. The network 12 provides a facility for communicating data between the devices. Connected to the network 12 is a meta store 20, a metadata extractor 24, an editor assistant 28, which also includes a video tape recorder 30, and an editor 34. The devices may use metadata for difference purposes. Each device is an example of a metadata node or meta node. The PDAs and the camera adapter box may also form meta nodes.

[0017] Also connected to the network 12 is a gateway 38 providing a facility for communicating with devices connected to the world-wide-web WWW represented as a cloud 42. Also forming part of the material development system in Figure 1 are three personal digital assistants (PDAs), PDA\_1, PDA\_2 and PDA\_3. Each of the PDAs includes an antenna AT1, AT2, AT3. As will be explained in the following paragraphs, each of the PDAs PDA\_1, PDA\_2, PDA\_3 is provided with a radio communications transmitter/receiver device. The radio transmitter/receiver is arranged to provide a wireless radio communications link with either the camera adapter box 2 attached to the camera 1 or the wireless ethernet communicator 10. The wireless radio communications link may operate in accordance with a wireless standard such as IEEE 802.11.

[0018] The personal digital assistants are one example of assistant devices operable to provide a portable means

for data storage and display and may include a user interface.

[0019] As will be explained in the following paragraphs, the material development system shown in Figure 1 provides a facility for generating a/v material which is recorded onto the cassette tape 4. As explained in our co-pending UK patent application numbers 0008431.9 and 0008427.7, the camera adapter box 2 generates metadata as the a/v material is produced and recorded onto the cassette tape 4. However, typically, the camera will be operated away from a studio in which facilities are provided for editing the a/v material into an a/v production. As such, when the camera 1 is operating off-site away from the studio, the camera adapter box 2 is arranged to store metadata on a removable hard disk 50 which is shown to form part of the utility box 2. Furthermore, when the camera is being operated away from the studio, a wireless communications radio link is formed between the camera adapter box 2 and the PDAs which are in radio communications range of the camera adapter box 2. Accordingly, when in range, the camera adapter box 2 can communicate metadata via the radio communications link to the PDAs PDA\_1, PDA\_2, PDA\_3. However, when the camera adapter box is in radio communications range of the ethernet wireless link 10, then metadata can be communicated via the wireless ethernet link to the network 12. Therefore any of the devices connected to the network 12 can have access to the metadata.

[0020] The a/v material itself, which is recorded onto the cassette tape 4, is typically transported separately and ingested into a VTR 30 by loading the cassette tape 4 into the VTR 30. As disclosed in our co-pending UK patent application 0008429.3, the VTR may form an ingestion processor, which is arranged to recover the a/v material from the cassette tape 4. However, as explained in our co-pending application 0008429.3, the metadata provides a facility for identifying content items present in the a/v material and for navigating through these content items using the metadata.

[0021] As shown in Figure 2, the cassette tape 4 includes a data store 60 which may be, for example, an electronically readable label such as a TELE-FILE™ label providing a facility for identifying the cassette tape 4. The label is therefore one example of a volume identifier (ID), which is used to identify the a/v material or a collection of a/v material on the cassette tape 4. Typically, but not exclusively, the volume ID identifies the data carrier (cassette tape) on which the a/v material is stored.

[0022] The camera 1 with the camera adapter box 2 is shown in more detail in Figure 2 with two of the PDAs PDA\_1, PDA\_2. The configuration shown in Figure 2 reflects a situation where the camera is used away from the network shown in Figure 1. Accordingly, as explained above, the PDAs are communicating with the camera adapter box 2 via the wireless communications link formed between the antennae AT\_1, AT\_2, 6 and the wireless transmitters and receivers 52, 54, 56.

[0023] As the camera 1 is generating the a/v material, the camera adapter box 2 is arranged to generate a proxy version of the a/v material. For the example of video material, a video proxy is produced. The video proxy provides a lower quality, lower bandwidth representation of the video material. The a/v proxy is then stored on the data store 50. The proxy may also be communicated on request to any of the PDAs PDA\_1, PDA\_2 via the wireless communications link. Furthermore, when the camera is within radio communications range of the ethernet wireless link 10, the a/v proxy may be communicated via the network 12 to any of the devices connected to the network 12. In other embodiments, the proxy version of the a/v material may be stored on an optical disk, instead of the data store 50, or as well as the data store 50, which provides a removal recording medium.

[0024] The system presented in Figures 1 and 2 provides an improved facility for generating a/v productions. This is provided by arranging for the camera adapter box to communicate metadata generated with the a/v material to either the PDAs or any device connected to the network when in range of the wireless ethernet link. As such the camera adapter box forms a meta node when in radio communications range of the network. Therefore, the generated metadata may be systematically accessed from any device on the network. Furthermore as explained in the following paragraphs the PDAs can be arranged to generate further metadata which can provide a preliminary edit of the a/v material using the metadata.

#### **Personal Digital Assistant**

[0025] As disclosed in our co-pending UK patent applications 0008431.9, 0008393.1 and 0008427.7, the PDAs PDA\_1, PDA\_2, provide an improved facility for producing an edited a/v production. To this end, embodiments of the present invention are able to introduce an improved workflow when generating a/v productions. The improved workflow is achieved by arranging for the camera adapter box 2 to communicate metadata to the PDAs PDA\_1, PDA\_2. Included within this metadata can be a representation of the audio/video proxy generated by the camera adapter box 2.

[0026] The personal digital assistants PDA\_1, PDA\_2 include a graphical user interface for displaying the video proxy and for entering commands and edit decisions with respect to the video proxy material. Part of the metadata communicated to the PDAs is the volume ID, that is the TELE-FILE™ label 60, of the tape 4. A user may enter edit decisions as the a/v material is generated.

[0027] A facility provided by the PDAs shown in Figure 2 is to identify a particular event, which has been captured

by the camera. For example, the camera 1 may be one of several cameras which are used to cover a sports event. If a particular event happens during for example a football match, such as a goal, then an editor can identify this event at the time or just after the event has occurred. According to an embodiment of the present invention, the PDAs are provided with a command, which is activated through the user interface to request metadata identifying the a/v material representing the event. The request is communicated via the radio communications link to the camera adapter box 2. In response to the request to mark an event, the camera adapter box 2 recovers the time code data at the time of the request and communicates the time code data to the PDAs. Optionally, the camera adapter box may also communicate the volume ID of the cassette tape 4. The PDAs are therefore provided with a unique identifier of the point in the a/v material where this event has been captured. As such, an advantage is provided in that the a/v material may be more easily edited or navigated through to identify the point in the a/v material where the event is captured.

[0028] In an alternative embodiment the camera adapter box is operable to communicate a Unique Material Identifier (UMID) in response to the request to mark an event from the PDA. The UMID can be used to identify a frame of video stored on a data carrier such as a hard-disk.

[0029] As mentioned above, the a/v proxy may form part of the metadata communicated on request to the PDAs via the wireless communications link. However, in order to avoid duplication of the a/v proxy version stored in the camera adapter box 2, and the a/v proxy communicated to the PDAs, the PDAs do not store the a/v proxy. Accordingly, an advantage is provided in that a plurality of versions of the a/v proxy are not made thereby avoiding the danger of multiple versions of the same a/v proxy and metadata existing which may later be confused.

## **Application Programmer's Interface**

[0030] In addition to the above mentioned aspects providing improvements in generating a/v-productions, embodiments of the present invention provide a facility for efficiently communicating metadata between devices connected to the network 12 or indeed the internet. As will be explained in the following paragraphs, embodiments of the present invention provide a facility for communicating metadata with any device or resource connected to the world-wide web. The communication and manipulation of metadata is achieved by providing a common application programmer's interface which is used by any device to send or receive metadata to or from any other device connected to the network 12 or the world-wide web 42.

[0031] The application programmer's interface may include middle-ware processors which allow separate application programs and common resources to communicate and work with one another. Figure 3 provides an example of a configuration of application programs which may be operating on any one of the devices 20, 24, 28, 34 or indeed the camera 1 or the PDAs PDA\_1 PDA\_2, PDA\_3. The application programs may send and receive metadata to application programs which are operating on other devices, or indeed on the same device. As shown in Figure 3, three application programs 100, 102, 104 are operating to process metadata as part of one of the devices connected to the network 12. So, for example, the first two application programs 100, 102 may be operating on the metadata extractor 24 whereas the third application program 104 may be operating on the editor 34. As shown in Figure 3, the metadata extractor 24 and the editor 34 form metadata nodes connected to the network 12.

[0032] Embodiments of the present invention provide an application programmer's interface for sending and receiving metadata from other application programmer's interfaces (API) so that the application programs 100, 102, 104 are provided with access to the metadata in a consistent and compatible manner. As such, a metadata trading API 120, 132, embodying the present invention is capable of sending and retrieving metadata from any other metadata trading API connected to the network 12 or indeed the world-wide web 42 via the gateway 38. The metadata API is shown in more detail in Figure 4.

[0033] As shown in Figure 4, the metadata trading API 120 provides access to metadata which describes the essence or attributes of a/v material to the application program 104 which may perform a particular function, such as editing, post processing or archiving. As shown in Figure 4, the metadata trading API comprises a signalling protocol processor 124, 122 and a file transfer processor 130, 136. The signalling protocol processor according to the example embodiment shown in Figure 4 operates in accordance with the Common Object Request Broker Architecture (CORBA) signalling protocol standard. The CORBA signalling protocol provides a protocol for remote invocation and querying of a data store or database. Other examples of signalling protocols are SOAP (Simple Object Access Protocol) or DCOM (Distributed Common Object Model), or indeed any other signalling protocol which is arranged to exchange query and response messages with a corresponding signalling protocol processor for accessing data.

[0034] The file transfer processor according to the example embodiment shown in Figure 4 is operable in accordance with a Hyper-Text Transfer Protocol (HTTP) to access metadata resources. The metadata resources could be, for example, a proxy of the a/v material, a key stamp of the video material, or a compressed representation of the video material. Correspondingly, the metadata resources could include an audio waveform server representative of the audio material, or indeed metadata resources could be any other type of metadata representing the content of information material generally. For the example embodiment, the metadata resource is the video proxy generated by the camera

adapter box representing the video material generated by the camera.

[0035] According to an example embodiment of the present invention, when the signalling protocol processor 120 requires access to metadata associated with a particular item of a/v material, the signalling protocol processor 124 provides at least two signalling messages which are a query string 128 and an alert string 134.

5 [0036] The query string is communicated to another metadata trading API on another meta node connected to the network as shown in Figure 3. The query string includes an identifier string identifying the a/v material item for which metadata is requested. For example, the query string may identify a shot present on a particular data carrier. In response to the query string, a metadata trading API generates a metadata string providing the metadata associated with the a/v material item. Accordingly, as shown in Figure 4, the signalling protocol processor 122 of the other metadata trading  
10 API 132 is arranged to respond to the query string by retrieving metadata associated with the a/v material item identified by the query string. The other metadata trading API 132 returns the metadata in the form a metadata string 140 and communicates the metadata string 140 in accordance with the CORBA signalling protocol to the original metadata trading API 120.

[0037] According to an embodiment of the present invention, the metadata string 140 is in the form of an extended mark-up language XML. The format of the XML metadata string 140 will be explained in more detail in the following paragraphs. However, typically, the metadata string 140 will include a resource identifier providing a location address of a metadata resource. The metadata resource will typically be a significant amount of data comprising binary information which is too large to be efficiently communicated by the signalling protocol processor. For the present example embodiment this is the video proxy generated by the camera adapter box 24.

20 [0038] The metadata string is delivered to the application program 104 as metadata. However, the metadata resource is not transferred with the metadata string. The metadata resource is accessible to the application program using the file transfer processor 130. The file transfer processor 130 is operable on request from the application program 104 to retrieve the metadata resource at the location address indicated by the resource identifier provided as part of the metadata string. In one embodiment, the resource identifier is a Uniform Resource Identifier (URI) address and the file  
25 transfer protocol is operable in accordance with a Hyper Text Transfer Protocol (HTTP) to retrieve the metadata resource. As will be appreciated, an advantage is provided by the metadata trading API in that the metadata resource is accessible via any appropriate web browser using the URI address. Accordingly, as will be appreciated, the metadata resource may exist on any of the metadata nodes on the devices connected to the network 12 or indeed a metadata resource is accessible from any address present on the world-wide web 42.

30 [0039] A further advantageous aspect of the metadata trading API embodying the present invention will now be explained with reference to Figure 5.

[0040] Figure 5 provides a simplified representation of the camera adapter box 2, which is linked to the data communications network 12 via the wireless ethernet card 10. However, as already explained, the camera adapter box 2 is only capable of communicating data when within a range of the wireless ethernet card 10. As such, the metadata  
35 stored in the camera adapter box is an example of a metadata resource which is volatile. Correspondingly, therefore, metadata stored in one of the devices connected to the network 12, such as the metadata store 20, the metadata extractor 24 or the editor 34, are examples of devices providing a persistent resource of metadata. A persistent metadata resource is one which remains permanently or semi-permanently at an address and is constantly accessible from the network.

40 [0041] In order to accommodate metadata resources which are volatile, that is to say resources which may not be available at a later point in time, the signalling protocol processor 122, 124 is arranged to generate an alert string 134 indicating that metadata is available. The alert string includes an identifier for the a/v material item for which the metadata was generated. In addition to the identifier, the alert string also includes an indication as to whether the metadata resource identified with respect to the a/v material is persistent or volatile. Accordingly, an application program may  
45 react to a received alert string by arranging for a metadata string to be received from the metadata node which generated the alert string, when the application program has an opportunity or a requirement to receive the metadata string. The application program can use the indication as to whether the metadata resource is volatile or persistent in order to decide whether or not to receive the metadata resource located at the URI address provided with the metadata string. If the alert string indicates that the metadata resource is persistent, then the API may not transfer the metadata resource to its application program until this is required. Not transferring the metadata resource until it is necessary to do so has  
50 an advantage of reducing an amount of data communicated on the network 12 thereby reducing a bandwidth requirement or congestion and therefore a time to access other metadata resources. If, on the other hand, the alert string indicates that the metadata resource is volatile, the metadata trading API 120 can be arranged to access the metadata resource by downloading the metadata resource to an application program via the API before the resource is no longer  
55 available.

[0042] As shown in Figure 5, therefore, the camera adapter box 2 sends an alert string to the metadata store 20 via the network 12 when the camera adapter box is within range of the wireless ethernet communications link provided by the wireless ethernet card 10. As shown in Figure 5, the alert string S1 identifies the a/v material item for which

metadata has been generated and an indication as to whether the metadata is persistent or volatile. For the present example, the metadata is volatile because the camera adapter box 2 is not permanently connected to the network. At some point later in time when the metadata store 20 is available to receive the metadata, the API operating on the metadata store 20 generates a query string. The query string provides a corresponding identification of the a/v material item for which the metadata is now to be transferred. In response to the query string, the camera adapter box 2 communicates a metadata string which comprises an XML data string to the metadata store 20. However, at step S4 because the alert string indicates that the metadata resource is volatile, the signalling protocol processor of the API of the meta store 20 arranges for the file transfer protocol 130 to transfer the metadata resource to the meta store 20 before the metadata resource is no longer available.

[0043] In the above explanation of the operation of the metadata trading API, the query string could be in the form of any query language such as XQL or SQL indicating an item of data entered into a relational database. Alternatively, the query string could be an Xpath query information data string, for accessing a database formed in a related way. Expressing the metadata in the form of an XML language provides an advantage in that metadata may be exchanged in a consistent and compatible way. The XML format of the metadata string will be explained in more detail in the following paragraphs.

### Metadata String Structure

[0044] An example of a metadata string in XML format is shown in Figure 6. XML is one example of a mark-up language in which a metadata string can be described, other examples being HTML, WML and SMIL (Synchronised Multi-media Integrated Language).

[0045] As shown in Figure 6, the first line of the XML metadata string provides a reference string for a schema which defines and specifies how the XML metadata string should be interpreted. The first line R.1 in Figure 6 provides a reference to an HTTP address of [www.w3.org/1999/xlink](http://www.w3.org/1999/xlink), from which an address of a web-site where a schema defining the structure and rules for interpreting the XML metadata string may be found.

[0046] The part of the XML metadata string which provides the location of the web-site for accessing the rules for the schema is called a 'namespace declaration'. The schema defining the correct structure of the metadata string may be declared within the XML string using the following semantics:

```
<Material_Description xmlns:xlink=http://www.w3.org/1999/xlink
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="D:\Temp\metanet_generated.xsd">
```

[0047] Two attributes which define the schema in a Material\_Description node are i) a namespace declaration specifying that the 'xsi' namespace will be used ('xsi' stands for XML Schema Instance) and 2) a noNamespaceSchemaLocation attribute. This is a way of defining the location of the schema document which is used to validate the structure of the XML document. The value of this attribute indicates that the schema is located on a local hard drive "D" in a directory "Temp", and the schema is called "metanet\_generated.xsd". This location could be a URI address that refers to a file on the world-wide web. However, this file could be owned, maintained and hosted by any particular organisation or company.

[0048] According to the example embodiment of the present invention represented in Figure 6, a minimum requirement for identifying a/v material for which metadata has been generated requires a volume identifier (ID) and a shot identifier (ID). The volume ID defines a volume within the metadata XML string and is defined between a start volume node V1 and an end volume node V2. After each volume node, the XML metadata string includes a set of metadata associated with the volume. The metadata associated with the volume MD\_V is shown in Figure 6 to include metadata fields such as "reporter", "producer", "country" and "tape number", etc. Also included in the metadata volume MD\_V is a material ID type which could be a Unique Material Identifier (UMID), a TELE-FILE label or a Globally or Universally Unique Identifier (UUID) which is represented at line MD\_V1. Also included as part of the volume metadata MD\_V is a URI address of a key stamp which identifies the volume associated with a time code of "01:00:00:01" provided in lines MD\_V2 and MD\_V3.

[0049] At a next level in the XML metadata string there is provided a shot node for identifying a shot of a/v material with which metadata is associated. A shot node in the XML metadata string is defined by a shot start node MD\_S1 and a shot end node MD\_S2. Within the shot node of the XML metadata string there is provided a set of metadata fields and values MD\_S. Included within the shot metadata MD\_S is a material ID type. The material ID type indicates

a UMID or a GUID provided in line MD\_S3, a title MD\_S4, a description MD\_S5, and a URI address of key stamps representing events within the shot MD\_S6, MD\_S7, MS\_S8. Also included within the shot metadata MD\_S is a metadata field and value identifying the Uniform Resource Identifier address of an audio waveform server MD\_S9.

[0050] Thus, as will be appreciated from the representation of the XML metadata string shown in Figure 6, the string includes a volume ID and a shot ID which are represented at different hierarchical levels, the shot being nested inside the volume node. Following each volume and shot node there is provided metadata associated with the volume and the shot respectively. A plurality of shot nodes may also be nested within a single volume and typically a/v material will be represented in this way for the metadata string. A simplified representation of the XML metadata string structure is shown below in which the metadata string starts with a URI for the schema for interpreting the metadata string at a root node level. A plurality of shots are arranged at a common hierarchical level which is the second hierarchical level shown below:

*<Material Description; Schema address>*

*<Metadata>*

*<Volume Material ID = "Vol 1">*

*<Shot Material ID = "Shot 1">*

*<UMID>*

*<URI>*

*</ Shot >*

*<Shot Material ID = "Shot 2">*

*</ Shot >*

*</Volume>*

*<Volume Material ID = "Vol 2">*

*...*

*...*

*...*

*</Volume>*

*</Material Description>*

[0051] According to the simplified XML metadata string presented above, metadata associated with a particular shot may be accessed with an X-path string using the following query string to access "Volume 012; Shot 023":

"xpath:\\Material\_Description\\Volume[Volume[@Material\_ID="Volume012"]\\Shot[@Material\_ID="Shot 023"]"

[0052] The term node or tree node is used to reflect a tree-like data structure which provides a hierarchy of data levels.

#### **Further Examples**

[0053] The structure of the XML metadata string allows shots to be placed within shots (as kind of sub shots). For instance, take a shot of Mike and Barney:



```

5      <Shot Material_ID="bigshot_01">
        <Label>Interview with Mike and Barney</Label>
        <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:10:00:00">
10     </Shot>

```

[0054] A shot may have two logical sections. For example the first part of an interview is with Mike. Then, the camera still rolling turns to Barney and does an interview with him. Even though this is physically one shot, this shot could be segmented into two 'sub-shots' by either a manual or automatic process. This can be represented in the XML in the following way:

```

20     <Shot Material_ID="bigshot_01">
        <Label>Interview with Mike and Barney</Label>

25         <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:10:00:00">
        <Shot Material_ID="subshotofbigshot_01_01">
30         <Label>Interview with Mike</Label>
        <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:05:00:00">
35     </Shot>
        <Shot Material_ID="subshotofbigshot_01_02">
        <Label>Interview with Barney</Label>
40     <InPoint Timecode="01:05:00:01" >
        <OutPoint Timecode = "01:10:00:00">
        </Shot>
45     </Shot>
    </Shot>

```

[0055] Furthermore, Mike's interview could be broken down again into two further sub-shots. For instance if Mike starts talking about his acting career, and then moves on to talk about his film directing, the metadata string could be represented as follows:

55

```

5      <Shot Material_ID="bigshot_01">
        <Label>Interview with Mike and Barney</Label>
        <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:10:00:00>
10      <Shot Material_ID="subshotofbigshot_01_01">
        <Label>Interview with Mike</Label>
        <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:05:00:00>
15      <Shot Material_ID="subshotofsubshotofbigshot_01_01">
        <Label>Mike the actor</Label>
        <InPoint Timecode="01:00:00:00" >
        <OutPoint Timecode = "01:02:30:00>
20      </Shot>
25      <Shot Material_ID="subshotofsubshotofbigshot_01_02">
        <Label>Mike the director</Label>
        <InPoint Timecode="01:02:30:01" >
        <OutPoint Timecode = "01:05:00:00>
30      </Shot>
35      </Shot>
40      <Shot Material_ID="subshotofbigshot_01_02">
        <Label>Interview with Barney</Label>
        <InPoint Timecode="01:05:00:01" >
45      <OutPoint Timecode = "01:10:00:00>
        </Shot>
50      </Shot>

```

[0056] Therefore any of the shots or sub-shots could be broken down into further sub-shots. The only limit would be that no sub-shot can be shorter than one frame, so this is the physical and logical limit of the nesting of shots within shots.

[0057] As will be appreciated from the foregoing description, the XML metadata string provides an encapsulated wrapper for metadata, which may be accessed using a query string. As will be appreciated by those skilled in the art, the query string defines the volume at the first hierarchy and the shot or sub-shot at the second hierarchy and possibly a particular item of, or field of, metadata which is being accessed by an API at a third hierarchy. The metadata string, alert string and query string are formed from ascii characters or Unicode.

[0058] Various modifications may be made to the embodiments hereinbefore described without departing from the scope of the present invention. In particular, it will be appreciated that any form of mark-up language could be used to describe the metadata string, XML being just one example. Furthermore, various modifications may be made to the XML metadata string without departing from the scope of the present invention. For example, other metadata examples may be introduced and the relative level of each of the volume and shot metadata types may be varied with the relative logical association of shots within volumes being maintained.

[0059] As explained above a/v material is just one example of information material, other examples being financial data, inventory data or any other kind of information data. As such in this context it will be appreciated that the term "shot" refers to a unit, portion or segment of the information material, which may have been generated over a particular period. For such an example, the shot would represent a snap-shot of the information material.

## Claims

1. A system for facilitating development of information material, said system comprising
  - a material generation apparatus operable to generate information material and metadata describing the content or attributes of the information material and to store said information material on a data carrier and to store said metadata separately in a data store,
  - at least one metadata node operable to process said metadata, and
  - a data communications network for providing a facility for communicating said metadata to and from said metadata node, wherein said data communications network and said material generation apparatus each include a wireless data communicator for providing a wireless data communications link with said material generation apparatus and said network, said wireless data communications link providing a facility for communicating said metadata to said metadata node via said network.
2. A system as claimed in Claim 1, wherein said wireless data communications device is arranged to detect whether data communications are available with said material generation apparatus, and if available to provide a facility for communicating said metadata to said metadata node via said network.
3. A system as claimed in Claim 1 or 2, comprising an assistant device including
  - a user interface,
  - a local data store for storing metadata, and
  - a wireless data communicator operable to provide a wireless data communications link to at least one of said data communications network and said material generation apparatus.
4. A system as claimed in Claim 2 or 3, wherein said metadata generation apparatus is operable to communicate said metadata with said metadata node via said network when said material generation apparatus is in range for wireless communications.
5. A system as claimed in Claim 3 or 4, wherein said material generation apparatus is operable to communicate said metadata to said assistant device, and said assistant device is operable to store said metadata in said local data store.
6. A system as claimed in Claim 3, 4 or 5, wherein said assistant device is operable to generate additional metadata, said additional metadata being associated with said metadata describing said information material and stored in said local data store.
7. A system as claimed in Claim 6, wherein said additional metadata includes edit decisions introduced by a user, the edit decisions being representative of edits of said material information.
8. A system as claimed in any of Claims 3 to 7, wherein said user interface provides a facility for entering said edit decisions, said edit decisions being stored in said local data store.
9. A system as claimed in any of Claims 3 to 8, wherein said local data store of said assistant device is a removable medium.

10. A system as claimed in any of Claims 3 to 9, wherein said material generation apparatus includes a recording device for storing said information material on a data carrier with material location data identifying a location on said data carrier of said information material, and said material generation apparatus is operable in response to a request communicated from said assistant device via said wireless communications link for material location data identifying an event represented by said information material to communicate the material location data of the information material representing said event.
11. A system as claimed in Claim 10, wherein said material generation apparatus is operable to communicate an identifier of said data carrier with said material location data of the information material representing said event.
12. A system as claimed in Claim 10 or 11, wherein said metadata generated by said material generation apparatus includes the material location data of information material on said data carrier.
13. A system as claimed in any preceding Claim, wherein said metadata is represented as metadata strings which include a resource identifier providing a location address of an associated metadata resource, said metadata string being communicable separately from said information material via said network and said associated metadata resource is accessible via said network using said resource identifier.
14. A system as claimed in any preceding Claim, wherein said metadata generated by the material generation apparatus includes a proxy version of said information material.
15. A system as claimed in Claim 13 and 14, wherein said information material includes video data, said proxy version providing a representation of said video data, and said user interface includes a display screen, said representation of said video data provided by said proxy being displayed to the user on said display screen.
16. A system as claimed in Claim 14 or 15, wherein said material generation apparatus includes a recording device operable to record said proxy version of said information material on an optical storage medium.
17. A system as claimed in Claim 13 to 16, wherein said associated metadata resource includes said proxy representation of said information material.
18. A system as claimed in Claim 15, 16 or 17, wherein said metadata node is operable to respond to an alert string generated by said material generation apparatus identifying that metadata is available to receive said metadata string in response to said alert string.
19. A system as claimed in any of Claims 13 to 18, wherein said resource identifier includes a Uniform Resource Identifier.
20. A method for facilitating development of information material comprising  
generating information material and metadata describing the content of the information material using a material generation apparatus,  
storing the information material on a data carrier and storing said metadata separately in a data store,  
providing a data communications network for communicating said metadata with at least one metadata node,  
wherein said data communications network includes a wireless data communications link, said wireless data communications link providing a facility for communicating said metadata between said metadata node and said material generation apparatus via said network.
21. A method as claimed in Claim 20, comprising  
communicating via said wireless communications link when said material generation apparatus is within communications range with said wireless communications link and otherwise  
communicating with an assistant device, forming a further metadata node.
22. Computer software having program code for carrying out a method according to Claim 20 or 21.
23. A medium for providing program code according to claim 22.

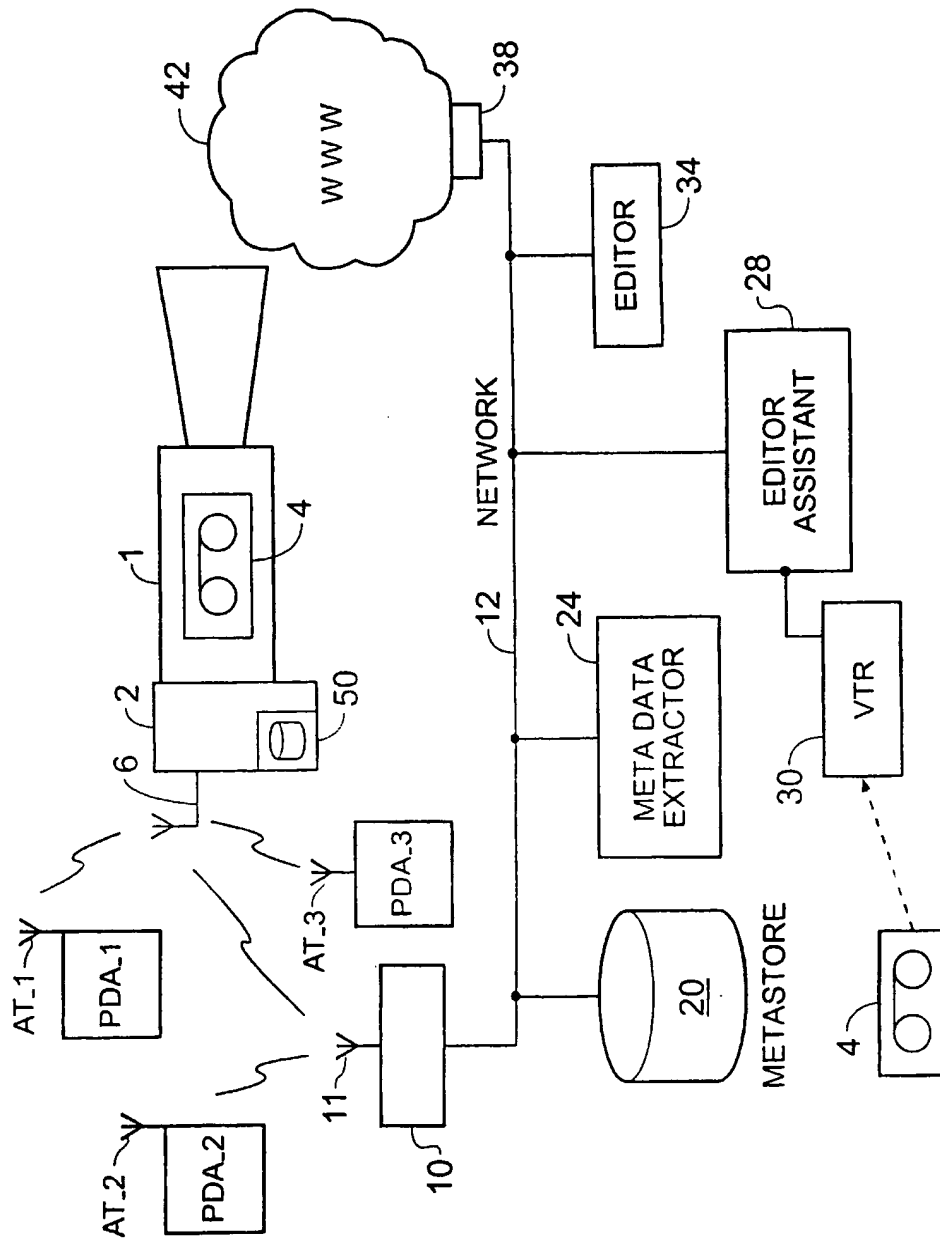


Fig. 1

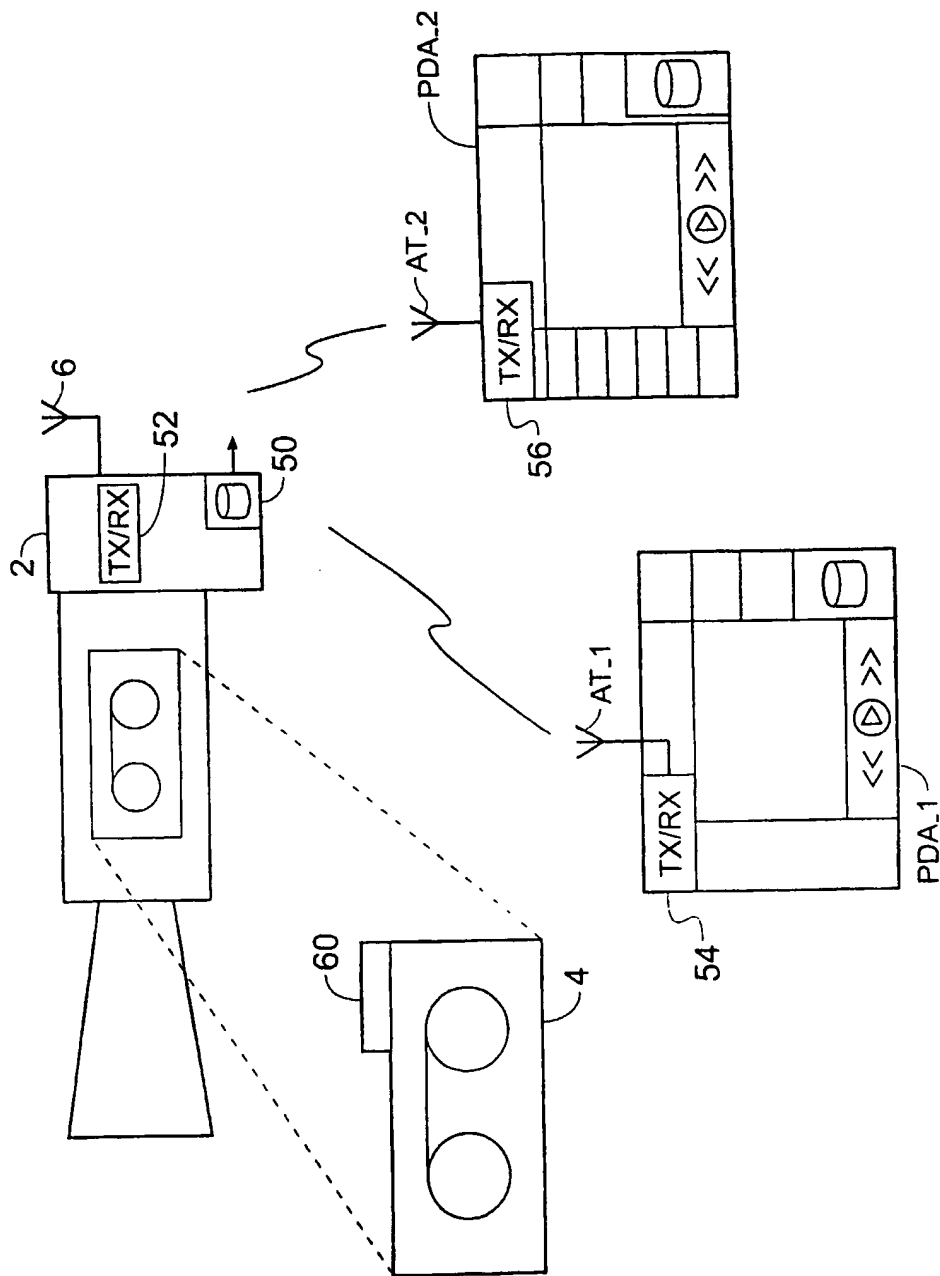


Fig. 2

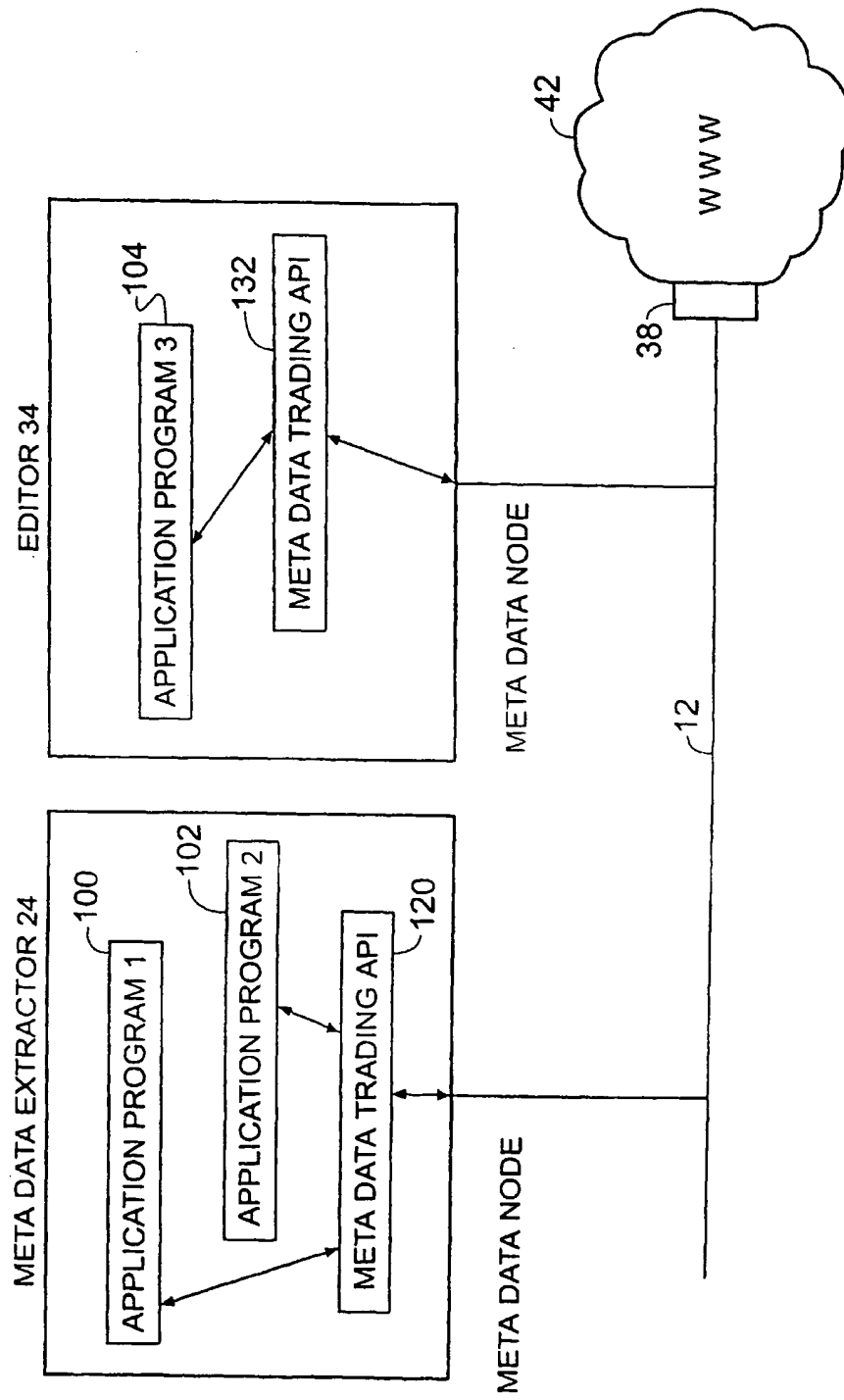


Fig. 3

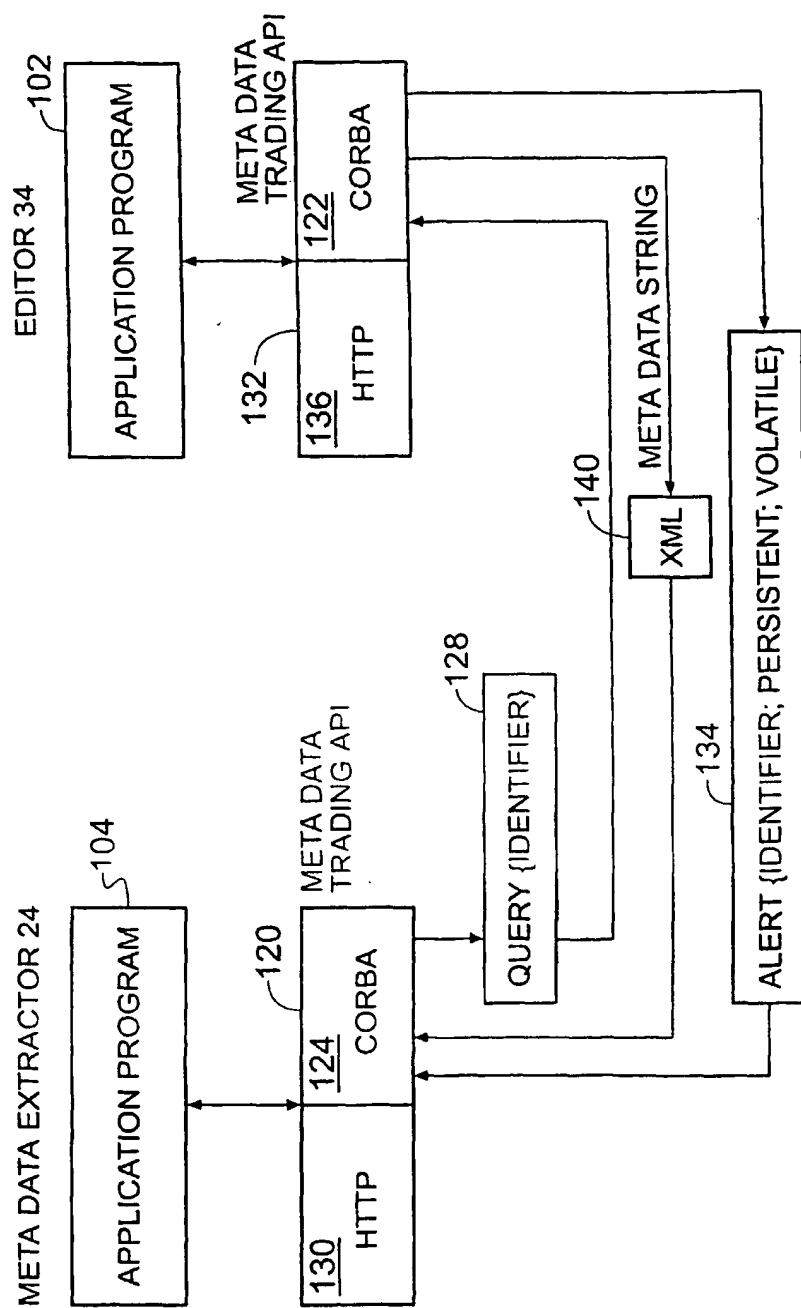


Fig. 4



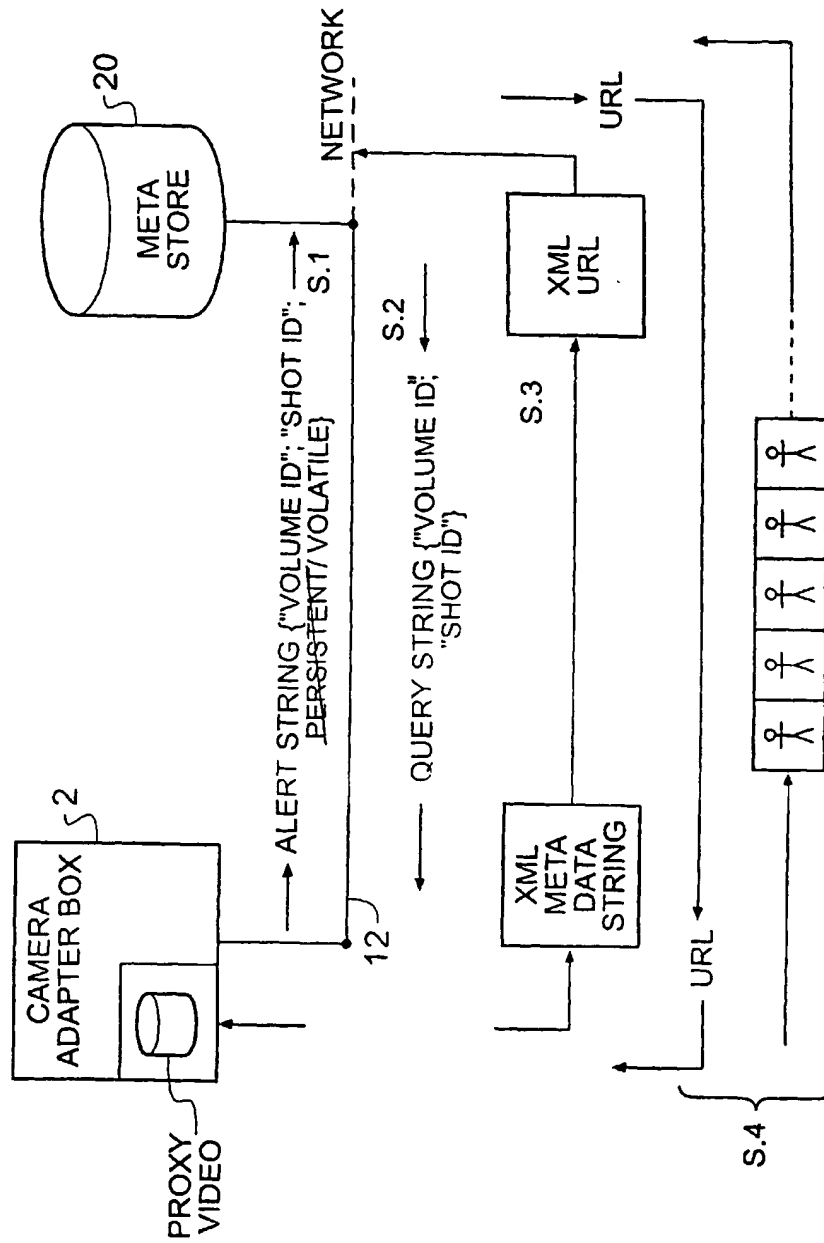


Fig. 5

```

- <Material_Description xmlns:xlink="http://www.w3.org/1999/xlink"> ~ NODE
  - <Volume> ~ V.1
    <Label> Reunion</label>
    <ReelNo />
    <TapeNumber/>
    <Country> UK</Country>
    <Producer />
    <Reporter/>
    <Crew />
    <Others />
    <TapeStatus />
    <Memo/>
    <Material_ID Type="UMID | Tele-File |
      GUID">040000000bb080000000000000000000002001514007f020000010520ff
      <Representative_Frame Timecode= "01:00:00:01" ~ MD.V.2
      xlink:href="http://avon/tools/keystamp.cgi? ~ MD.V.3
      File=movies/shotstore/040000000bb080000000000000000000002001514007f
      xlink:type="simple" />
      <Format Field.Rate= "60 | 59.97 | 25 | 50 > Betacam SX</Format>
      <Shot Aspect.Ratio="16:9 | 4:3 | 14:9" Creation_Time="10:30:05:00 ~ MD.S.1
      07/11/00">
    <Material_ID Type= "UMID |
      GUID">040000000bb080000000000000000000002001514007f020000010520
      <Title>Reunion17</Title> ~ MD.S.4
      <Status>OK</Status>
      <Description>A shot</Description> ~ MD.S.5
      <Notes> Enter any old text here for annotating your shot</Notes>
      <Take>1</Take>
      <Proxy_Video Start_Frame="18" Duration="2056" xlink:type="simple"
      xlink: href= "http://avon/movies/shotstore/040000000bb08000000000000000000000
      <InPoint Timecode="01:00:00:01"
      xlink: href="http://avon/tools/keystamp.cgi? ~ MD.S.6
      File = movies / shotstore / 040000000bb0800000000000000000000002001514002
      xlink:type="simple" />
      <OutPoint Timecode="01:00:05:19"
      xlink: href="http://avon/tools/keystamp.cgi? ~ MD.S.7
      File = movies/shotstore/040000000bb0800000000000000000000002001514002
      xlink:type="simple"/>
      <Representative_Frame Timecode= "01:00:00:01"
      xlink: href="http://avon/tools/keystamp.cgi? ~ MD.S.8
      File =movies/shotstore/040000000bb0800000000000000000000002001514002
      xlink:type="simple"/>
      <Proxy_Audio Start_Frame="18" Duration="2056"
      xlink: href="http://avon/tools/waveform.cgi?
      File= movies/shotstore/040000000bb0800000000000000000000002001514002
      xlink:type="simple"/>
      <Speech Confidence="6" />
      <Face Confidence= "0" />
      <Interview Confidence= "5" />
    - <Phrase Inpoint="01:00:00:01" Outpoint="01:03:00:01" >
      <Proxy_Audio Start_Frame="18" Duration= "500" xlink:type="simple"
      xlink : href= "http://avon/tools/waveform.cgi?
      File=movies/shotstore/040000000bb08000000000000000000000020015140
      <Speech_Transcript>is a the</Speech_Transcript>
    </Phrase>

```

MD.V

MD.S

MD.V.1

MD.V.2

MD.V.3

MD.S.1

MD.S.4

MD.S.5

MD.S.6

MD.S.7

MD.S.8

MD.S.9

R.1

Fig. 6A

```

- <EventLog Timecode="01:00:01:16" Event_Time="10:30:04:24
  07/11/00">
  <Keystamp xlink:href= "http://avon/tools/keystamp.cgi?
    File= movies/ shotstore/0400000000bb0800000000000000000020015140
    xlink:type="simple"/>
  <LoggedBy>paulp</LoggedBy>
  <LoggingTime> 10:30:05:00 07/11/00</LoggingTime>
  <EventType > POI </EventType >
  <Description> some description </Description >
  </EventLog>
- <EventLog Timecode="01:00:02:21" Event_Time="10:30:04:28
  07/11/00">
  <Keystamp xlink:type="simple"
    xlink:href= "http://avon/tools/keystamp.cgi?
    File=movies/shotstore/0400000000bb0800000000000000000020015140
  <LoggedBy>paulp</LoggedBy>
  <LoggingTime> 10:30:05:00 07/11/00</LoggingTime>
  <EventType>POI</EventType>
  <Description> some description </Description>
  </EventLog>
</Shot> ~ MD.S.2
</Volume> ~ RV.2

```

Fig. 6B